

AMENDMENTS TO THE CLAIMS

Please cancel claims 50-51 without prejudice. Kindly amend claims 53 and 71 as shown in the following listing of claims. The listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims

1. (original) A storage controller, comprising:
 - a device interface adapter, for interfacing the storage controller to a plurality of logical storage devices;
 - a host interface adapter, for interfacing the storage controller to a plurality of host computers; and
 - a microprocessor, coupled to said device interface adapter and host interface adapter, for processing requests to transfer data between said plurality of logical storage devices and said plurality of host computers;wherein each of said requests specifies one of said plurality of host computers and one of said plurality of logical storage devices for transferring said data between, wherein said host interface adapter is configured to receive said requests and to determine for each of said requests whether the host computer identified in said request is allowed to access the logical storage device identified in said request.
2. (original) The storage controller of claim 1, wherein if said host interface adapter determines said host computer identified in said request is allowed to access said logical storage device identified in said request, said host interface adapter provides said request to said microprocessor, wherein said microprocessor responsively controls said device interface adapter to cause said device interface adapter to access said logical storage device specified in said request to transfer said data between said logical storage device and the storage controller.
3. (original) The storage controller of claim 1, wherein if said host interface adapter determines said host computer identified in said request is not allowed to access said logical storage device identified in said request, said host interface adapter transmits to said host computer a response indicating that said host computer identified in said request is not allowed to access said logical storage device identified in said request.
4. (original) The storage controller of claim 1, wherein if said host interface adapter determines said host computer identified in said request is not allowed to access said logical storage device identified in said request, said host interface adapter provides to said microprocessor an indication that said host computer identified in said request is not allowed to access said logical storage device identified in said request.

5. (original) The storage controller of claim 4, wherein said microprocessor causes said host interface adapter to transmit a response to said host computer identified in said request in response to said indication, wherein said response indicates said host computer is not allowed to access said logical storage device identified in said request.
6. (original) The storage controller of claim 1, wherein said host interface adapter is configured to interface said storage controller to said one or more host computers via an interface protocol.
7. (original) The storage controller of claim 6, wherein said interface protocol comprises Fibre Channel.
8. (original) The storage controller of claim 6, wherein said interface protocol comprises Small Computer Systems Interface (SCSI).
9. (original) The storage controller of claim 6, wherein said interface protocol comprises Internet SCSI (iSCSI).
10. (original) The storage controller of claim 6, wherein said interface protocol comprises one of the following protocols: Infiniband, Ethernet, TCP/IP, HIPPI, Token Ring, Arcnet, FDDI, LocalTalk, ESCON, FICON, ATM, SAS, SATA, and combinations thereof.
11. (original) The storage controller of claim 1, further comprising:
 - a buffer memory, coupled to said device interface adapter and said host interface adapter, for buffering data transferred between said plurality of host computers and said plurality of logical storage devices via said host interface adapter and said device interface adapter.
12. (original) The storage controller of claim 11, wherein said microprocessor manages use of said buffer memory by said host interface adapter and said device interface adapter.
13. (original) The storage controller of claim 1, wherein said microprocessor performing said processing requests comprises performing redundant array of inexpensive disks (RAID) processing.
14. (original) The storage controller of claim 1, wherein said plurality of logical storage devices comprise one or more physical storage devices.
15. (original) The storage controller of claim 1, wherein said plurality of logical storage devices comprise one or more disk storage devices.
16. (original) The storage controller of claim 1, wherein said plurality of logical storage devices comprise one or more CDROM storage devices.
17. (original) The storage controller of claim 1, wherein said plurality of logical storage devices comprise one or more tape storage devices.
18. (original) The storage controller of claim 1, further comprising:

- a plurality of said microprocessors, coupled to said host interface adapter and said device interface adapter, wherein said host interface adapter determines which one of said plurality of microprocessors is configured to process requests for said logical storage device identified in said request and provides said request to said determined one of said plurality of microprocessors.
19. (original) The storage controller of claim 1, wherein each of said requests specifies one of said plurality of host computers based on a unique world wide name.
 20. (original) The storage controller of claim 1, wherein each of said requests specifies one of said plurality of host computers based on an internet protocol address.
 21. (original) The storage controller of claim 1, wherein each of said requests specifies one of said plurality of host computers based on an identifier in a SCSI request.
 22. (original) The storage controller of claim 1, wherein each of said requests specifies one of said plurality of logical storage devices in a protocol-specific manner.
 23. (original) The storage controller of claim 22, wherein said protocol-specific manner comprises an identifier in a SCSI request.
 24. (original) A storage controller for providing hosts controlled access to logical storage devices, comprising:
 - a memory, for storing an access table specifying which of the hosts has access to which of the logical storage devices; and
 - an interface adapter, coupled to said memory, configured to interface the storage controller with a transport medium, receive on said transport medium from one of the hosts a request to access one of the logical storage devices, and determine from said access table whether said one of the hosts has access to said one of the logical storage devices.
 25. (original) The storage controller of claim 24, wherein said interface adapter is configured to interface the storage controller with said transport medium according to a predetermined protocol.
 26. (original) The storage controller of claim 25, wherein said predetermined protocol comprises Fibre Channel.
 27. (original) The storage controller of claim 25, wherein said predetermined protocol comprises Small Computer Systems Interface (SCSI).
 28. (original) The storage controller of claim 25, wherein said predetermined protocol comprises Internet SCSI (iSCSI).
 29. (original) The storage controller of claim 25, wherein said predetermined protocol comprises one of the following protocols: Infiniband, Ethernet, TCP/IP, HIPPI, Token Ring, Arcnet, FDDI, LocalTalk, ESCON, FICON, ATM, SAS, SATA, and combinations thereof.

30. (original) The storage controller of claim 25, wherein said predetermined protocol comprises a low-level block protocol.
31. (original) The storage controller of claim 24, further comprising:
a microprocessor, coupled to said interface adapter, for programming said interface adapter to cause said interface adapter to transfer data on said transport medium.
32. (original) The storage controller of claim 31, wherein if said interface adapter determines that said one of the hosts has access to said one of the logical storage devices, said interface adapter provides said request to said microprocessor, and said microprocessor responsively processes said request to cause said one of the logical storage devices to be accessed.
33. (original) The storage controller of claim 31, wherein said microprocessor comprises a general purpose microprocessor.
34. (original) The storage controller of claim 31, wherein said microprocessor is distinct from said interface adapter.
35. (original) The storage controller of claim 31, further comprising:
a buffer memory, coupled to said interface adapter, for buffering data transferred between the hosts and the logical storage devices.
36. (original) The storage controller of claim 35, wherein said microprocessor is configured to manage use of said buffer memory for buffering said data.
37. (original) The storage controller of claim 35, wherein said interface adapter includes a direct memory access controller for controlling transfers of said data between said interface adapter and said buffer memory.
38. (original) The storage controller of claim 35, wherein said buffer memory comprises said memory for storing said access table.
39. (original) The storage controller of claim 31, wherein said microprocessor does not include a direct memory access controller.
40. (original) The storage controller of claim 31, further comprising:
a storage device interface adapter, coupled to said microprocessor, configured to interface the storage controller with the logical storage devices.
41. (original) The storage controller of claim 40, wherein said microprocessor causes said storage device interface adapter to transfer data between the logical storage devices and the storage controller in response to said interface adapter providing said request to said microprocessor.
42. (original) The storage controller of claim 24, wherein said interface adapter comprises a single integrated circuit.

43. (original) The storage controller of claim 24, wherein said interface adapter comprises a set of integrated circuits specialized for performing a predetermined protocol on said transport medium.
44. (original) The storage controller of claim 24, wherein the storage controller creates said access table in said memory in response to user input.
45. (original) The storage controller of claim 44, further comprising:
a management controller, coupled to said memory, for creating said access table in response to user input.
46. (original) The storage controller of claim 24, wherein said interface adapter maps a first identifier to a second identifier, wherein said first identifier is included in said request and is used by the host to specify said one of the logical storage devices, wherein said second identifier is used by the storage controller to specify said one of the logical storage devices.
47. (original) The storage controller of claim 46, wherein said interface adapter uses said second identifier to determine from said access table whether said one of the hosts has access to said one of the logical storage devices.
48. (original) The storage controller of claim 24, wherein said memory for storing said access table is comprised within said interface adapter.
49. (original) The storage controller of claim 24, wherein said memory for storing said access table is directly coupled to said interface adapter.
- 50-51. (canceled)
52. (original) A method for controlling access by host computers to logical storage devices, the method comprising:
performing a protocol to receive a request from a host computer to access a logical storage device;
determining whether the host computer has access to the logical storage device;
and
causing the logical storage device to transfer data, if the host computer has access to the logical storage device based on said determining;
wherein said performing the protocol and said determining are performed by an interface adapter, and said causing the logical storage device to transfer the data is performed by a microprocessor distinct from the interface adapter.
53. (currently amended) A storage ~~controller router~~—for providing virtual local storage on remote storage devices to ~~hosts devices~~, comprising:
a buffer providing memory work space for the storage ~~router controller~~;

- a first ~~interface adapter controller~~ operable to connect to and interface with a first transport medium, operable to implement access controls for storage space on the storage devices;
 - a second ~~interface adapter controller~~ operable to connect to and interface with a second transport medium; and
 - a ~~microprocessor supervisor unit~~ coupled to the first ~~interface adapter controller~~, the second ~~interface adapter controller~~ and the buffer, the ~~microprocessor supervisor unit~~ operable to map between hosts devices connected to the first transport medium and the storage devices and to process data in the buffer to interface between the first ~~interface adapter controller~~ and the second ~~interface adapter controller~~ to allow access from hosts devices connected to the first transport medium to the storage devices using native low level, block protocols.
54. (original) A storage controller for providing host computers access to storage devices, comprising:
- a microprocessor, for identifying each of the storage devices according to a unique internal identifier, and for processing requests to access the storage devices, each of said requests including a host identifier and an external identifier, said host identifier identifying one of the host computers making said request, and said external identifier identifying one of the storage devices to be accessed; and
 - a host interface adapter, coupled to said microprocessor, for receiving said requests from the host computers and mapping said external identifier received in said request to its said unique internal identifier based on said host identifier received in said request.
55. (original) The storage controller of claim 54, further comprising:
- a mapping table, accessible by said host interface adapter, for storing mapping information, wherein said host interface adapter maps said external identifier received in said request to its said unique internal identifier based on said host identifier received in said request using said mapping information stored in said mapping table.
56. (original) The storage controller of claim 55, wherein each unique combination of host identifier and external identifier identifies a single one of the storage devices according to a many-to-one mapping.
57. (original) The storage controller of claim 54, wherein said host interface adapter provides said unique internal identifier and said request to said microprocessor for processing after said mapping said external identifier to said unique internal identifier.
58. (original) The storage controller of claim 54, wherein said host interface adapter is further configured to perform a low-level protocol to interface the storage controller with the host computers.

59. (original) The storage controller of claim 54, wherein said unique internal identifier identifies a logical storage device, wherein said logical storage device comprises a grouping of physical storage devices.
60. (original) The storage controller of claim 54, wherein said unique internal identifier identifies a logical storage device, wherein said logical storage device comprises a portion of a grouping of physical storage devices.
61. (original) The storage controller of claim 54, wherein said unique internal identifier identifies a logical storage device, wherein said logical storage device comprises a portion of a physical storage device.
62. (original) The storage controller of claim 54, wherein each of said requests specifies one of the storage devices in said external identifier in a protocol-specific manner.
63. (original) The storage controller of claim 62, wherein said protocol-specific manner comprises a SCSI logical unit number.
64. (original) The storage controller of claim 54, wherein said external identifier comprises a SCSI logical unit number.
65. (original) The storage controller of claim 54, wherein said host interface adapter is further configured to perform access control based on said unique internal identifier and said host identifier.
66. (original) A method for mapping host-specific storage device identifiers to storage controller-specific storage device identifiers, the method comprising:
- receiving from a host computer a request to access one of a plurality of storage devices coupled to a storage controller, the request specifying an identifier of the host computer and an identifier of the one of the plurality of storage devices, wherein said receiving is performed by a host interface adapter of the storage controller;
 - mapping a combination of the host computer identifier and the identifier of the one of the plurality of storage devices to a unique identifier used by a microprocessor of the storage controller to identify the one of the plurality of storage devices, wherein said mapping is performed by the host interface adapter; and
 - providing the unique identifier to the microprocessor for processing the request, wherein said providing is performed by the host interface adapter.
67. (original) A storage controller, comprising:
- a first microprocessor, for processing requests from a host computer to access one of a first set of logical storage devices coupled to the storage controller;
 - a second microprocessor, for processing requests from said host computer to access one of a second set of logical storage devices coupled to the storage controller; and

an interface adapter, coupled to said first and second microprocessors, for receiving said requests from said host computer, and for each of said requests determining whether said request specifies a logical storage device in said first set or said second set and providing said request to one of said first and second microprocessors based on said determining.

68. (original) The storage controller of claim 67, wherein said first and second set of logical storage devices are distinct.

69. (original) The storage controller of claim 67, wherein said first and second set of logical storage devices are programmable.

70. (original) The storage controller of claim 67, wherein said first and second set of logical storage devices are user-configurable.

71. (currently amended) A storage ~~controller router~~—for providing virtual local storage on remote storage devices to ~~hosts devices~~, comprising:

a buffer providing memory work space for the storage ~~controller router~~;

a first ~~interface adapter controller~~—operable to connect to and interface with a first transport medium, operable to map between ~~hosts devices~~—connected to the first transport medium and the storage devices;

a second ~~interface adapter controller~~—operable to connect to and interface with a second transport medium; and

a ~~microprocessor supervisor unit~~—coupled to the first ~~interface adapter controller~~, the second ~~interface adapter controller~~ and the buffer, the ~~microprocessor supervisor unit~~—operable to implement access controls for storage space on the storage devices and to process data in the buffer to interface between the first ~~interface adapter controller~~ and the second ~~interface adapter controller~~—to allow access from ~~hosts devices~~—connected to the first transport medium to the storage devices using native low level, block protocols.